I CLAIM:

1. A nano-porous metal oxide semiconductor with a band-gap of greater than 2.9 eV in-situ spectrally sensitized on its internal and external surface with metal chalcogenide nano-particles with a band-gap of less than 2.9 eV containing at least one metal chalcogenide, wherein said nano-porous metal oxide further contains a phosphoric acid or a phosphate.

2. Nano-porous metal oxide according to claim 1, wherein said metal oxide is selected from the group consisting of titanium oxides, tin oxides, niobium oxides, tantalum oxides and zinc oxides.

3. Nano-porous metal oxide according to claim 1, wherein said nano-porous metal oxide further contains a triazole or diazole compound.

4. A process for in-situ spectral sensitization of nano-porous metal oxide semiconductor with a band-gap of greater than 2.9 eV on its internal and external surface with metal chalcogenide nano-particles with a band-gap of less than 2.9 eV, containing at least one metal chalcogenide, comprising a metal chalcogenide-forming cycle comprising the steps of: contacting nano-porous metal oxide with a solution of metal ions; contacting nano-porous metal oxide with a solution of chalcogenide ions; and subsequent to metal chalcogenide formation rinsing said nano-porous metal oxide with an aqueous solution containing a phosphoric acid or a phosphate.

5. Process according to claim 4, wherein said contact with a solution of metal ions occurs before said contact with a solution of chalcogenide ions.

6. Process according to claim 4, wherein said metal chalcogenide-forming cycle is repeated.

7. Process according to claim 4, wherein said solution of metal ions contains a triazole or diazole compound.

8. Process according to claim 4, wherein said solution of metal ions and said solution of chalcogenide ions contains a triazole or diazole compound.

9. Process according to claim 4, wherein said solution of chalcogenide ions contains a triazole or diazole compound.

10. Process according to claim 4, wherein said nano-porous metal oxide is selected from the group consisting of titanium oxides, tin oxides, niobium oxides, tantalum oxides and zinc oxides.

11. Process according to claim 4, wherein said nano-porous metal oxide further contains a triazole or diazole compound.

12. A photovoltaic device containing a nano-porous metal oxide semiconductor with a band-gap of greater than 2.9 eV in-situ spectrally sensitized on its internal and external surface with metal chalcogenide nano-particles with a band-gap of less than 2.9 eV containing at least one metal chalcogenide, wherein said nano-porous metal oxide further contains a phosphoric acid or a phosphate.

13. Photovoltaic device according to claim 12, wherein said nano-porous metal oxide is selected from the group consisting of titanium oxides, tin oxides, niobium oxides, tantalum oxides and zinc oxides.

14. Photovoltaic device according to claim 12, wherein said nano-porous metal oxide further contains a triazole or diazole compound.

15. A second photovoltaic device containing a nano-porous metal oxide semiconductor with a band-gap of greater than 2.9 eV in-situ spectrally sensitized on its internal and external surface with metal chalcogenide nano-particles with a band-gap of less than 2.9 eV containing at least one metal chalcogenide prepared according to a process for in-situ spectral sensitization of nano-porous metal oxide semiconductor comprising a metal chalcogenide-forming cycle comprising the steps of: contacting nano-porous metal oxide with a solution of metal ions; contacting nano-porous metal oxide with a solution of chalcogenide ions; and subsequent to metal chalcogenide formation rinsing said nano-porous metal oxide with an aqueous solution containing a phosphoric acid or a phosphate.

16. Second photovoltaic device according to claim 15, wherein said contact with a solution of metal ions occurs before said contact with a solution of chalcogenide ions.

17. Second photovoltaic device according to claim 15, wherein said metal chalcogenide-forming cycle is repeated.

18. Second photovoltaic device according to claim 15, wherein said solution of metal ions contains a triazole or diazole compound.

19. Second photovoltaic device according to claim 15, wherein said solution of metal ions and said solution of chalcogenide ions contains a triazole or diazole compound.

20. Second photovoltaic device according to claim 15, wherein said solution of chalcogenide ions contains a triazole or diazole compound.

21. Second photovoltaic device according to claim 15, wherein said nano-porous metal oxide is selected from the group consisting of titanium oxides, tin oxides, niobium oxides, tantalum oxides and zinc oxides.

22. Photovoltaic device according to claim 15, wherein said nano-porous metal oxide further contains a triazole or diazole compound.